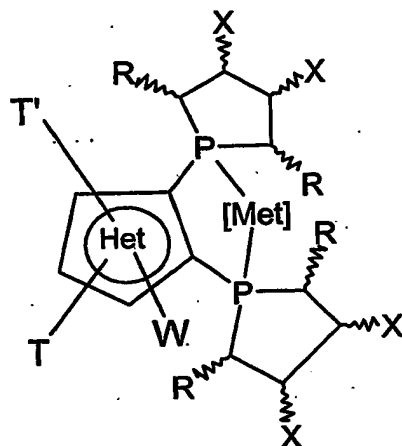


CLAIMS

1. Metallic catalysts of the formula (I)



(I)

where:

[Met] is a metal selected from the group consisting of Ru, Rh, Ir, Pt, Pd, Ni, Re, and Cu, having a number of oxidation n , where n is 0, +1, +2 or +3, and containing possible ancillary co-ligands for completing its state of valence;



represents an aromatic pentatomic heterocycle, containing at least one hetero-atom selected from the group consisting of: oxygen, sulphur and nitrogen;

T and T', which are the same as or different from one another, are selected from the group consisting of hydrogen, a linear, cyclic or branched C1-C10 alkyl, hydroxyalkyl, alkoxyalkyl, phenyl, alkylphenyl, naphthyl, alkoxyphenyl, dialkylaminophenyl, carboxyphenyl, carbalkoxyphenyl, or else T and T', taken together, form an aromatic carbocyclic ring, possibly substituted by one or more

alkyl, hydroxy, alkoxy, dialkylamino, carboxy, carbalkoxy or sulphonic groups;

W is a substituent present only when the hetero-atom is nitrogen and is selected from H, a linear, cyclic or branched C1-C10 alkyl, alkoxyalkyl, phenyl, alkylphenyl, naphthyl, alkoxyphenyl, dialkylaminophenyl, carboxyphenyl, carbalkoxyphenyl;

5 R is selected from hydrogen, a linear, cyclic or branched C1-C10 alkyl, hydroxyalkyl, alkoxyalkyl, phenyl, alkylphenyl;

X is selected from H, a linear, cyclic or branched C1-C10 alkyl, hydroxy, alkoxy, benzyloxy, acyloxy, O-tetrahydropyranyl, O-tetrahydrofuranyl, or else where the two substituents X, taken together with m carbon atoms bound thereto, with m = 1,
10 2 or 3, form a carbocyclic ring with a total of 5-7 atoms or a saturated heterocyclic ring with 5-7 atoms.

2.The catalysts according to Claim 1, characterized in that they are in racemic form.

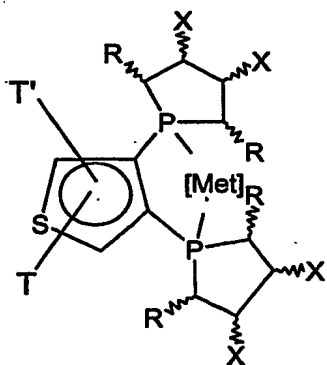
3.The catalysts according to Claim 1, characterized in that they are in meso form.

15 4. The catalysts according to Claim 1, characterized in that they are in enantiomerically enriched form of configuration R or S with the limitation, that:

a) the carbon atoms in positions 2' and 5' of the phospholanic rings possess the same absolute configuration with respect to one another;

b) the carbon atoms in positions 3' and 4' of the phospholanic rings possess the same absolute configuration with respect to one another.

20 5. The catalysts, according to any one of Claims 1-4, of formula (V)

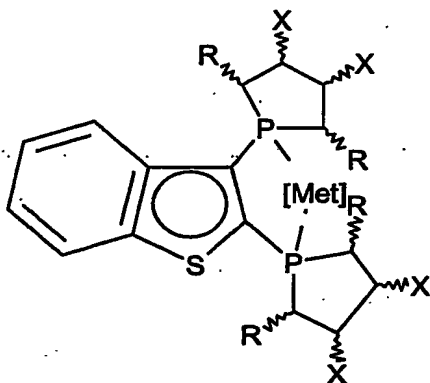


(V)

in which T, T', R, X and [Met] have the meanings indicated above.

6. The catalysts, according to any one of Claims 1-4, of formula (VI)

5

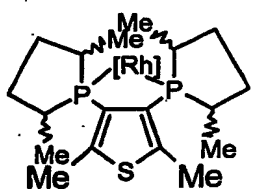


(VI)

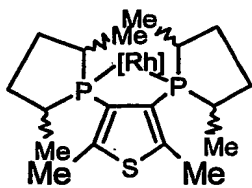
in which R, X and [Met] have the meanings indicated above.

7. The catalysts according to Claim 5, characterized in that T and T' are both H or both methyl.

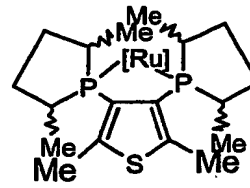
10 8. The catalysts according to Claim 5, selected from the group consisting of:



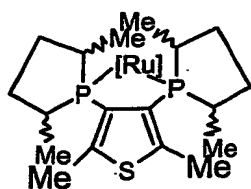
[Rh] = Rh(COD)BF₄



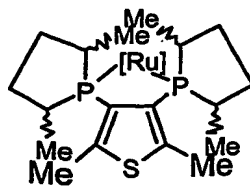
[Rh] = Rh(COD)OTf



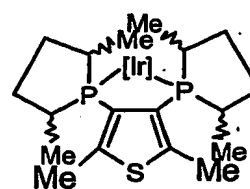
[Ru] = Ru(p.cimene)I



[Ru] = Ru(bis metallol)



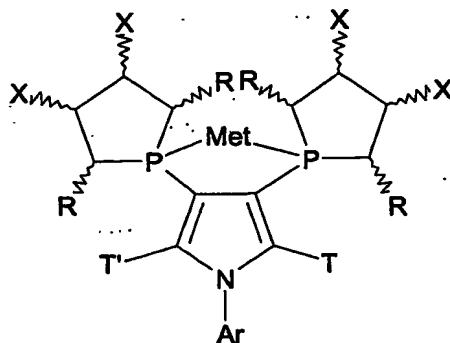
[Ru] = RuX₂



[Ir] = Ir(COD)OTf

where the two stereocentres in positions 2' and 5' of the phospholanic rings have both absolute configuration (R) or both absolute configuration (S).

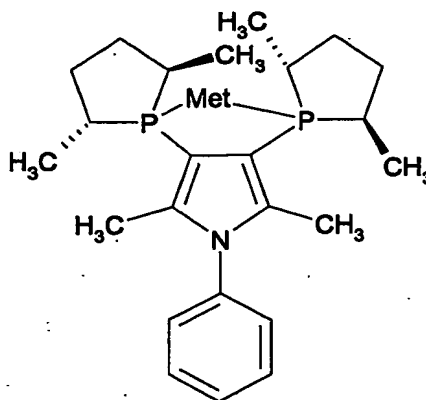
9. The catalysts according to anyone of claims 1-4 of formula (VII):



(VII)

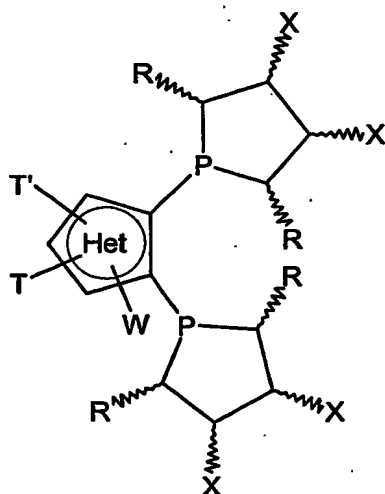
wherein T and T' preferably are both H or both the same linear, cyclic or branched C1-C10 alkyl, R is CH₃, Ar is an electron donor aryl residue.

10. The catalyst according to claim 9 having the following formula



wherein Met has the aforesaid meanings.

11. Ligands with an ortho *bis*(1-phospholanyl)heteroarenic structure of formula (IA)



(IA)

in which



represents an aromatic pentatomic heterocycle, containing at least one heteroatom selected from the group consisting of oxygen, sulphur and nitrogen;

T and T', which are the same as or different from one another, are selected from hydrogen, a linear, cyclic or branched C1-C10 alkyl, hydroxyalkyl, alkoxyalkyl, phenyl, alkylphenyl, naphthyl, alkoxyphenyl, dialkylaminophenyl, carboxyphenyl, carbalkoxyphenyl, or else T and T' taken together form an aromatic carbocyclic ring possibly substituted by one or more alkyl, hydroxy, alkoxy, dialkylamino, carboxy, carbalkoxy or sulphonic groups;

W is a substituent present only when the hetero-atom is nitrogen and is selected from H, a linear, cyclic or branched C1-C10 alkyl, alkoxyalkyl, phenyl, alkylphenyl, naphthyl, alkoxyphenyl, dialkylaminophenyl, carboxyphenyl, carbalkoxyphenyl;

R is selected from hydrogen, a linear, cyclic or branched C1-C10 alkyl, hydroxyalkyl, alkoxyalkyl, phenyl, alkylphenyl;

X is selected from H, a linear, cyclic or branched C1-C10 alkyl, hydroxy, alkoxy, benzyloxy, acyloxy, O-tetrahydropyranyl, O-tetrahydrofuranyl, or else where the two substituents X, taken together with m carbon atoms bound thereto, with m = 1, 2 or 3, form a carbocyclic ring with a total of 5-7 atoms or a saturated heterocyclic ring with 5-7 atoms.

12. The ligands according to Claim 11, characterized in that they are in racemic form.

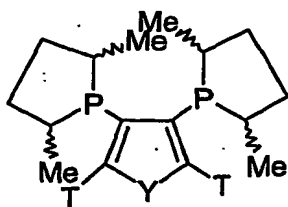
13. The ligands according to Claim 11, characterized in that they are in meso form.

14. The ligands according to Claim 11, characterized in that they are in enantiomerically enriched form of configuration R or S with the limitation, that:

a) the carbon atoms in positions 2' and 5' of the phospholanic rings possess the same absolute configuration with respect to one another;

b) the carbon atoms in positions 3' and 4' of the phospholanic rings possess the same absolute configuration with respect to one another.

15. The ligands according to any one of Claims 11-14, characterized in that they have the following formula (II)

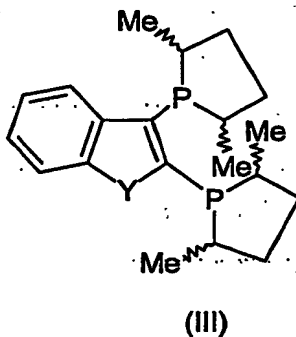


(II)

and in which Y is selected from O, S and N(W), T and W are selected from hydrogen and methyl, and where the carbon atoms in positions 2' and 5' of the

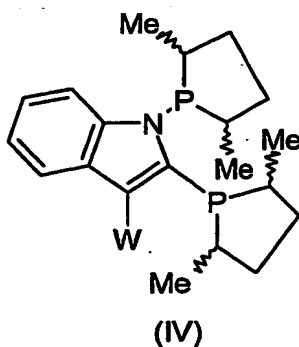
phospholanic rings have both absolute configuration (R) or both absolute configuration (S).

16. The ligands according to any one of Claims 11-14, characterized in that they have the following formula (III).



in which Y is selected from O, S and N(W), T and W are selected from hydrogen and methyl, and where the carbon atoms in positions 2' and 5' of the phospholanic rings have both absolute configuration (R) or both absolute configuration (S).

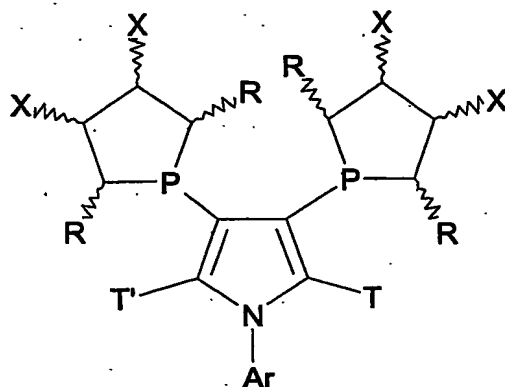
17. The ligands according to any one of Claims 11-14, characterized in that they have the following formula (IV).



and in which W is selected from hydrogen and methyl and where the carbon atoms in positions 2' and 5' of the phospholanic rings have both absolute configuration (R) or both absolute configuration (S).

18. The ligands according to anyone of claims 11-14 characterised by having the following general formula (VIIA)

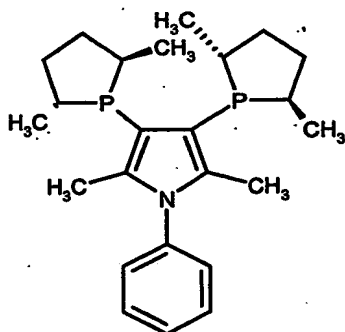
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(VIIA)

- 5 wherein T and T' preferably are both H or both the same linear, cyclic or branched C1-C10 alkyl, R is CH₃, Ar is an electron donor aryl residue.

19. The ligand according to claim 18 characterised by having the following formula



- 10 20. A process of preparation of the catalysts according to any one of Claims 1-10, comprising the reaction of [Met] in which [Met] has the aforesaid meanings, with the ligands according to any one of Claims 11-18.
20. Use of the catalysts according to any one of Claims 1-10 in chemoselective syntheses.
- 15 21. Use of the catalysts according to any one of Claims 1-10 in regioselective syntheses.
22. Use of the catalysts according to anyone Claims 1, 4, 8-10 in stereoselective syntheses.

23. Use according to Claim 22, in which said stereoselective syntheses are selected from the group consisting of hydrogenation of C=C, C=O, C=N groups, isomerization of enamines and formation of C-C bonds.

24. Use according to Claim 22, in which said reactions of C-C formation are selected from the group consisting of the Heck reaction, the Diels-Alder reaction, allylic substitution and aldolic condensation.